



The Southwest Region

Arizona, California, Nevada

A Diversity of Renewable Resources

The Mojave Desert in southern California, along with much of the Southwest, is home to some of the most intense solar energy on the face of the earth. But solar energy is not the only renewable resource in this region. To the northwest and southeast lie the geothermal power plants of Coso Hot Springs and the Salton Sea. To the west and south are the wind plants of Tehachapi and San Geronio. Further north, just east of San Francisco, is the Altamont Pass, another major wind resource area. Considering these resources, along with the region's more limited biomass and hydropower resources, the Southwest has the most diverse renewable energy resource base in the United States.

California — Renewable Energy Pioneer

California leads the nation in producing electricity from renewable energy technologies, relying on wind energy, biomass, geothermal energy, solar thermal energy, and photovoltaics for almost 15 percent of its capacity. California produces about 90 percent of the nation's wind and geothermal electricity. All of the nation's solar thermal electric capacity can be found in California.

Just east of Barstow, California, nine solar thermal electric plants track the sun's daily movement across the desert sky. These plants, producing a total of 354 megawatts, are the largest solar installations in the world. In fact, they represent more than 90 percent of the world's capacity of utility-scale solar thermal power plants. In 1998, these plants generated just over 1 billion kilowatt-hours for the Southwestern grid. Also near Barstow stands the 10-megawatt Solar Two power tower demonstration project.

For wind energy, California relies primarily on three mountain passes — San Geronio, west of Palm Springs; Altamont, east of San Francisco; and Tehachapi, north of Los Angeles. In total, California wind farms boast almost 15,000 wind turbines that provide more than 1,600 megawatts of electric generation.

Geothermal energy is also prevalent in California. Much of the state lies in the Pacific "Ring of Fire," where tectonic plates meet, fissures form, and the heat of the earth's interior comes close to the surface. North of San Francisco in the Coastal Range, for example, is The Geysers, a large region of hydrothermal resources with temperatures often reaching 300° F. This is one of only two locations in the world where high-pressure dry steam is used directly to turn turbines and generate electricity.

Today, there are more than 20 geothermal generating units at The Geysers, owned and operated by electric utili-

ties and independent power producers. The plants supply 1,655 megawatts of power and produce more electricity than any other geothermal field in the world — enough for approximately 1 million typical California homes. They provide this electricity at rates comparable to conventional power sources. Geothermal fields exist in other locations throughout the state. Several companies and utilities have already tapped these resources for more than 780 megawatts of power. Experts believe that the state has the potential for another 4,000 megawatts, using existing technology.

In California, electricity customers have been able to choose their electricity suppliers since March 1998. Some suppliers are offering "clean" electricity services and options to the state's electricity consumers. Commonwealth Edison Corporation provides 100% "green power" to more than 50,000 residential and small business customers from renewable energy sources.

Patagonia, a Ventura, California-based outdoor clothing manufacturer, purchases 100 percent renewable energy from Enron Energy Services. Enron will provide approximately 1 million kilowatt-hours per year to power Patagonia's 14 California facilities from a new 16-megawatt wind power facility in Palm Springs, California.

Toyota Motor Sales is the single largest purchaser of 100 percent renewable power. Edison Source will supply approximately 38 million kilowatt-hours per year for Toyota's U.S. headquarters and several other California facilities.

In 1998, Santa Monica became the first local government in California to commit to buying green power for its municipal needs. The 5 megawatts of green power required to serve the city's electricity loads were obtained through a competitive process.

Even though California leads the nation in its use of renewable electricity, it also leads the nation in consumption of natural

gas. Importing 90 percent of the gas it consumes cost the state's electric utilities some \$1.5 billion in 1997. Since 1990, the state's utilities have increased their consumption of natural gas by one-third.



Pacific Gas & Electric

Geothermal power plants are located throughout California. The largest geothermal field in the world is The Geysers, near San Francisco.



Ed Linton

California's Altamont Pass wind plant produces enough electricity to power the residential sector of a city the size of San Francisco. Wind plants are compatible with other land uses such as agriculture and ranching. Cattle graze under the wind turbines at Altamont Pass.

California has taken important policy steps to ensure that renewables will play an important role in its restructured electric power industry. In its 1996 restructuring legislation, California adopted a nonbypassable distribution system charge for "public interest" programs, including \$540 million over 4 years to fund a mix of production incentives, project financing support, and customer rebates for renewables. These incentives will provide near-term support to existing projects and increasing levels of support to new technologies. Beyond that, emerging technologies such as photovoltaics, solar thermal, renewable-based fuel cells, and small wind, will be provided support through rebates, buy-downs, or similar incentives. Customers who purchase renewable electricity will also receive rebates of up to 1.5 cents per kilowatt-hour.

Nevada and Arizona Plan for the Future

Unlike California, the Southwest's other two states, Arizona and Nevada, aren't facing problems with electricity imports—they are both net exporters. They are also unlike California in that, although they share a large renewable resource base, they are just beginning to exploit it. Although nearly 17 percent of Arizona's electrical capacity is supplied by hydroelectric power, almost none of Arizona's capacity comes from other forms of renewable energy. In addition, Nevada has less than 4 percent of its electricity supplied by non-hydropower renewables.

Nevada has 218 megawatts of installed electric capacity from renewable energy. Of this, 210 megawatts are from geothermal resources, supplying enough electricity for 150,000 homes. The electricity generated annually by the Nevada geothermal sites is enough to offset the need to import more than 700,000 tons of coal or 15 trillion cubic feet of natural gas. It also offsets power plant emissions—geothermal plants emit no nitrogen oxides, negligible particulate matter, 90 percent less sulfur dioxides than fossil fuels, and far less carbon dioxide than coal.

The Sacramento Municipal Utility District

At the Sacramento Municipal Utility District's (SMUD's) Rancho Seco power plant site, a field of photovoltaic arrays generates as much as 2 megawatts of power. Nearby are the inactive twin cooling towers of the site's nuclear plant.

While decommissioning the plant, SMUD has been procuring and building alternative energy systems. As a result, it has installed more photovoltaic power than any other utility in the nation today. One SMUD program has helped over 400 homeowners install 4-kilowatt photovoltaic systems on their roofs; another offers an opportunity for residential and commercial customers to fund community rooftop photovoltaic systems. Building on the success of its first installation, SMUD is adding 360 kilowatts of photovoltaics to the Rancho Seco site.

Photovoltaics represents only a part of the utility's alternative energy strategy. In the Montezuma Hills of Solano County, 5 megawatts of wind turbines are producing approximately 100 million kilowatt-hours of energy per year. SMUD also purchases power output from biomass and geothermal plants. SMUD is cooperating with Folsom Prison in a program to use methane from biomass to produce electricity. SMUD is one of the principal collaborators on Solar Two, the 10-megawatt power tower in Barstow, California.

In response to the competitive California electricity market, SMUD is now offering its customers a variety of green power choices, including an option to purchase all or part of their power from renewable sources. By the year 2000, SMUD expects to generate enough electricity from renewable energy systems to power 375,000 typical Sacramento homes.

In 1998, Arizona Public Service (APS) began operating a new 82-kilowatt solar power plant built in Tempe, for which more than 600 residents are paying a premium price to receive clean power. A 100-kilowatt solar electric plant in Gilbert built by the Salt River Project (SRP) has been equally successful. The 100-watt block subscriptions sold out in the first week to 700 customers. There are currently 2,000 other customers on a waiting list. In addition to a second solar plant, SRP is planning a solar-methane plant at an East Valley landfill run by the Salt River Pima-Maricopa Indian Community north of Mesa.